# ICSE CLASS 10 EXAMINATION

## PRACTICE QUESTION PAPER

# PHYSICS

### Chapter 6 : SPECTRUM

*(Deviation and Dispersion by a Prism · Colours and Wavelengths · Electromagnetic Spectrum · Properties and Uses of Radiations · Scattering of Light)*

**Maximum Marks: 40** **Time allowed: One hour**

*1. Answers to this Paper must be written on the paper provided separately.*

*2. You will not be allowed to write during the first 5 minutes. This time is to be spent in reading the question paper.*

*3. The time given at the head of this Paper is the time allowed for writing the answers.*

*4. **Section A** is compulsory. Attempt **all** questions from Section A and **any two** questions from Section B.*

*5. The intended marks for questions or parts of questions are given in brackets [ ].*

*6. Take the speed of light in vacuum as $c = 3 \times 10^8$ m $s^{-1}$, 1 nm = $10^{-9}$ m and 1 Å = $10^{-10}$ m. Figures are for completion on the answer sheet; colours may be named or labelled by their initial letters.*

## SECTION A (20 Marks)

*(Attempt all questions from this Section.)*

### Question 1

Choose the correct answers to the questions from the given options. *(Do not copy the question, write the correct answers only.)* **[8]**

(i) When a beam of white light passes through a glass prism, the colour that is deviated the least is:

(a) violet (b) green

(c) yellow (d) red

(ii) Which of the following electromagnetic waves has the longest wavelength?

(a) X-rays (b) infrared rays

(c) ultraviolet rays (d) gamma rays

(iii) The speed of light in vacuum is $3 \times 10^8$ m $s^{-1}$. The wavelength of light of frequency $6 \times 10^{14}$ Hz is:

(a) 500 nm (b) 200 nm

(c) 5000 nm (d) 50 nm

(iv) The blue colour of the sky is due to:

(a) dispersion of sunlight (b) scattering of sunlight

(c) reflection of sunlight (d) refraction of sunlight

(v) Assertion (A): Red light is used for danger signals.

Reason (R): Red light has the longest wavelength in the visible spectrum and is scattered the least by the atmosphere.

(a) (A) is true and (R) is false.

(b) (A) is false and (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct explanation for (A).

(d) Both (A) and (R) are true, but (R) is not the correct explanation for (A).

(vi) The electromagnetic radiation used to detect a fracture in a bone is:

(a) infrared rays (b) X-rays

(c) microwaves (d) radio waves

(vii) To obtain the spectrum of ultraviolet radiation, the prism should be made of:

(a) glass (b) rock salt

(c) quartz (d) water

(viii) When light passes from air into glass, which of the following quantities remains unchanged?

(a) speed (b) wavelength

(c) frequency (d) direction

## Question 2

(a) Define (i) dispersion of light and (ii) a spectrum. **[2]**

(b) Fig. 1 shows a narrow beam of white light PQ incident on the face AB of a glass prism ABC. A screen is placed on the other side of the prism. **[3]**

(i) Complete the diagram to show the path of the light through the prism and the spectrum formed on the screen. **[1]**

(ii) Label the colours at the two extreme ends of the spectrum on the screen. **[1]**

(iii) Name the phenomenon responsible for the formation of the spectrum. **[1]**

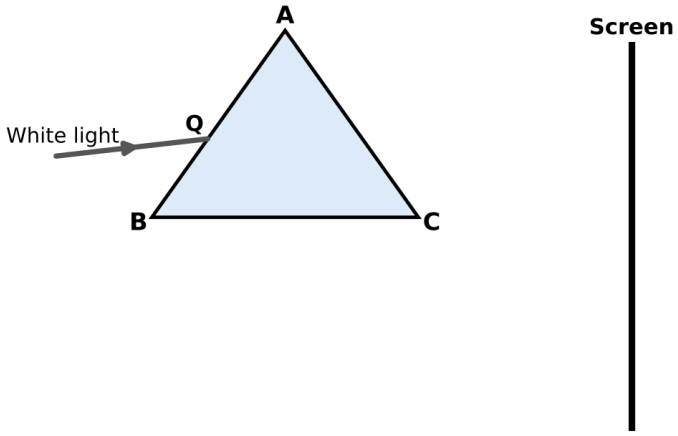



*Fig. 1*

(c) When sunlight enters the earth's atmosphere, name the colour of light that is scattered (i) the most and (ii) the least. **[1]**

## Question 3

(a) Orange light has a wavelength of 6000 Å in air. Calculate (i) its wavelength in metres, (ii) its frequency, and (iii) its wavelength in glass, in which the speed of this light is $2 \times 10^8$ m $s^{-1}$. **[3]**

(b) Fig. 2 shows a narrow beam of light consisting of blue, red and green colours incident on a rectangular glass slab. **[3]**

(i) Complete the diagram to show the path of the three colours inside the slab and after emerging from it. **[1]**

(ii) State how the emergent light will appear. **[1]**

(iii) Give a reason why the colours do not separate on emerging from the slab. **[1]**

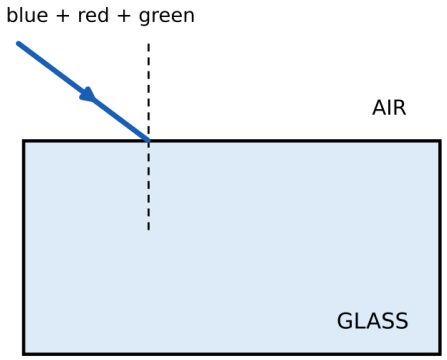



*Fig. 2*

## SECTION B (20 Marks)

*(Attempt any two questions from this Section.)*

### Question 4

(a) An X-ray has a frequency of $6 \times 10^{18}$ Hz. Calculate (i) its wavelength in metres, (ii) its wavelength in Å, and (iii) state the assumption made in the calculation. **[3]**

(b) Give a reason for each of the following: (i) Infrared radiations are used for photography in fog. (ii) A rock-salt prism is used to obtain the infrared spectrum. (iii) Ultraviolet lamps have a quartz envelope instead of glass. **[3]**

(c) Fig. 3 shows a beam of red, green and violet light incident normally on the face AB of a right-angled isosceles glass prism ABC. The critical angle of glass for green light is 45°. **[4]**

(i) Complete the diagram to show the path of each colour after it meets the face AC. Mark the angle of incidence on AC. **[2]**

(ii) Name the colour that emerges from the face BC and the phenomenon involved. **[1]**

(iii) Give a reason why red light emerges from the face AC. **[1]**

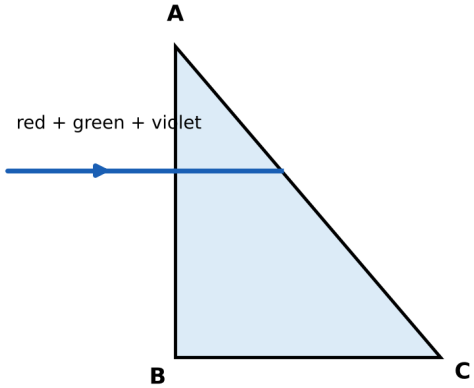



*Fig. 3*

## Question 5

(a) State three properties that are common to all electromagnetic waves. **[3]**

(b) Fig. 4 shows the electromagnetic spectrum arranged in the order of increasing wavelength. Four of the regions are marked P, Q, R and S. **[3]**

(i) Name the waves P, Q, R and S. **[2]**

(ii) Which of the waves P, Q, R, S has the highest frequency? **[1]**

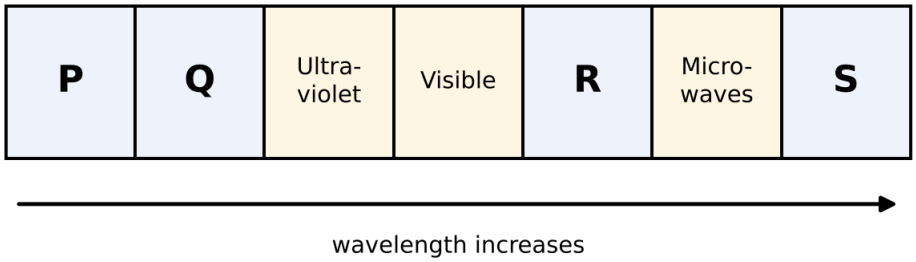



*Fig. 4*

(c) Fig. 5 shows sunlight reaching two observers: X at noon along path P, and Y at sunset along path Q, through the earth's atmosphere. **[4]**

(i) Which path, P or Q, is longer through the atmosphere? **[1]**

(ii) State the colour of the sun seen by Y and explain why. **[2]**

(iii) State the colour of the sky as seen by an astronaut on the moon, with a reason. **[1]**

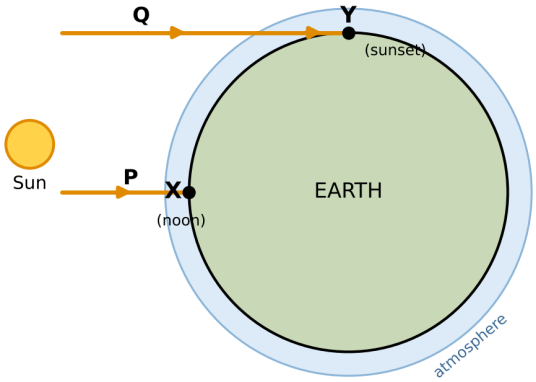



*Fig. 5*

## Question 6

(a) Name the radiation and state one use of each: (i) the radiation of wavelength just longer than that of red light, (ii) the radiation of wavelength just shorter than that of violet light, (iii) the radiation of wavelength 0.01 Å. **[3]**

(b) State three differences between ultraviolet radiations and infrared radiations. **[3]**

(c) Fig. 6 shows the spectrum of sunlight on a screen. Three identical thermometers with blackened bulbs are placed at P (just beyond the violet end), Q (in the green) and R (just beyond the red end). **[4]**

(i) Which thermometer shows the fastest rise in temperature? Name the radiation responsible. **[2]**

(ii) A paper soaked in silver chloride is placed at each of the three positions. At which position will it darken the most? **[1]**

(iii) Name the material of the prism needed to obtain the radiation falling at P. **[1]**

Spectrum of sunlight on a screen

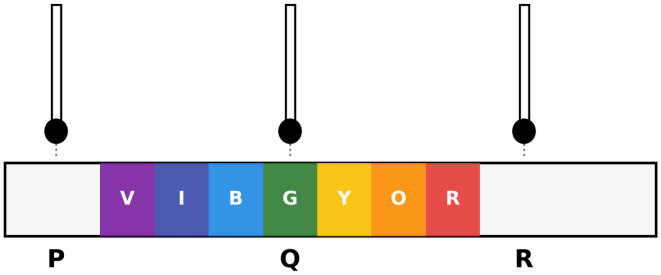



*Fig. 6*

**— End of Question Paper —**